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TITLE: AUDIO PLAYBACK APPARATUS, AUDIO
PLAYBACK METHOD, AND PROGRAM

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AUDIO PLAYBACK APPARATUS, AUDIO PLAYBACK METHOD, AND PROGRAM

BACKGROUND OF THE INVENTION

The present invention relates generally to an audio playback apparatus and, more particularly, to an audio playback apparatus which is capable of randomly reproducing music.

Related-art audio playback apparatuses are configured such that, when reproducing music recorded to recording media such as CD (Compact Disk) and MD (Mini Disk), the recorded music may be reproduced in a random manner. Especially, with in-vehicle audio playback systems, random playback is often used for the safety reason that an operation for music selection during driving may endanger driving. With such random playback, although a range of music to be reproduced may be specified in a limited manner, the music to be randomly selected is limited to only one piece of music at a time.

Technologies are known in which, when randomly selecting music files to be reproduced, one of the areas (folders) each directly storing music files is randomly selected, then one of the music files is selectively reproduced, and, after the reproduction, folder selection

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is executed again to randomly selectively reproduce one of the music files (for example, refer to patent document 1).

[Patent document 1]

Japanese Patent Laid-open No. 2002-269958

However, with the related-art playback apparatuses for reproducing small-size recording media such as CD and MD, it is enough for the random playback of one piece of music at a time; with recently-developed audio playback apparatuses which use large-size recording media such as DVD (Digital Versatile Disc) and hard disk and therefore may record stacks of music albums, needs are increasing for the random playback of music on an album or folder basis in addition to the random playback of one piece of music at a time.

Especially, with in-vehicle audio playback apparatuses, random playback is often used because the acts during driving of selecting one album from among many and selecting desired pieces of music from the selected album pose a danger to driving; with the related-art random playback in which playback is performed in unit of one piece of music, if a desired piece of music has been reproduced and the user wants to listen to all pieces of music in the album in which the

piece of music just reproduced is contained, the user

must executes cumbersome operations of clearing the

random playback mode and, after listening to that album,

entering the random playback mode again. Thus, although

the capabilities of random reproduction on an album or a

folder basis provide very high user-friendliness, none of

the related-art audio playback apparatuses have these

capabilities to the knowledge of the applicant thereof.

It should be noted that the technology disclosed in

the above-mentioned patent document 1 is associated with

a random playback apparatus which provides the random

playback in unit of one piece of music by repeating

random playback operations by executing the selection on

a folder basis as first selection means and then

selecting one of the music files contained in the

selected folder file as second selection means, thereby

minimizing the continuous selection of music files in the

same folder. Also, the above-mentioned patent document

does not disclose an effective technology which supports

the random playback in unit of an album or a folder.

It is therefore an object of the present invention

to provide an audio playback apparatus capable of

performing random playback in unit of an album or a

folder.

SUMMARY OF THE INVENTION

In carrying out the invention and according to one
aspect thereof, there is provided an audio playback
apparatus characterized by, in a sound source in which a
plurality of music files are recorded in a hierarchical
manner, the specification of a unit of a music file group
in which the plurality of music files recorded in the
sound source are reproduced in a batch; the random
selection of the music file group in the unit specified
by the playback unit specification means; and the
playback of all music files included in the music file
group selected by the music file group selection means.
The above-mentioned sound source records a folder, an
album formed in the folder, and a music file formed in
the album in a hierarchical manner and, as a unit of
music file groups which are reproduced in a batch, a
music file, an album, or a folder may be specified.
Especially, if the folder is specified as the unit of
music file groups which are reproduced in a batch, albums
may be randomly selected from the selected music file
group to reproduce the music files for each selected
album.

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Also, the above-mentioned audio playback apparatus is characterized by the specification of the selected area of music file groups. Especially, for the sound source hierarchically formed with folders, albums formed in each folder, and music files formed in each album, the album, the folder, or all areas of the sound source may be specified as a music file group selected area.

Further, in the playback of music files contained in a selected music file group, these files may be sequentially reproduced in the order of their recording to the sound source. Also, these music files may be randomly reproduced.

In carrying out the invention and according to another aspect thereof, there is provided an audio playback characterized by that music files are recorded to the sound source for each album which is the minimum unit in a set of music files, albums to be reproduced are randomly selected from the sound source, and music files are reproduced on an album basis.

In carrying out the invention and according to still another aspect thereof, there is provided an audio playback apparatus characterized by that music files are recorded to the sound source for each folder storing albums providing the minimum unit in a set of music files,

a folder to be reproduced is randomly selected from the sound source, and music files are reproduced on a folder basis.

In carrying out the invention and according to yet another aspect thereof, there is provided an audio playback method comprising the steps of: specifying, in a sound source in which a plurality of music files are recorded in a hierarchical manner, a unit of a music file group in which the plurality of music files recorded in the sound source are reproduced in a batch; randomly selecting the music file group in the unit specified by the playback unit specification step; and reproducing all music files included in the music file group selected by the music file group selection step.

The above-mentioned audio playback method further comprises a selected area specification step for specifying an selected area of the music file group. The above-mentioned playback step randomly reproduces the music files included in the selected music file group. If, from the sound source recording a folder, an album formed in the folder, and a music file formed in the album in a hierarchical manner, the folder is specified in the playback unit specification step, randomly selecting the album from the music file group selected by the music

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file group selection step; wherein the playback step reproduces music files for each selected album.

In carrying out the invention and according to a different aspect thereof, there is provided a program for causing a computer to execute the functions of: specifying, in a sound source in which a plurality of music files are recorded in a hierarchical manner, a unit of a music file group in which the plurality of music files recorded in the sound source are reproduced in a batch; randomly selecting the music file group in the unit specified by the playback unit specification function; and reproducing all music files included in the music file group selected by the music file group selection function.

The above-mentioned program further comprising the function of specifying the selected area of music file groups. In addition, if, from the sound source recording a folder, an album formed in the folder, and a music file formed in the album in a hierarchical manner, the folder is specified by the playback unit specification function, a function of randomly selecting the album from the music file group selected by the music file group selection function; wherein the playback function reproduces music files for each selected album.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other objects of the invention will be seen by reference to the description, taken in connection with the accompanying drawing, in which:

FIG. 1 is a block diagram illustrating a configuration of an audio playback apparatus of the invention;

FIG. 2 is a schematic diagram illustrating a configuration inside a sound source in which music files are recorded in a hierarchical manner;

FIG. 3 is a flowchart showing of the processing flow of SHUF-A mode;

FIG. 4 is a flowchart showing of the processing flow of SHUF-F mode;

FIGS. 5A and 5B show menu screens which are displayed when the mode for reproducing music in unit of pieces of music is selected;

FIGS. 6A, 6B, and 6C show menu screens which are displayed when the mode for reproducing music in unit of albums is selected;

FIG. 7 is a flowchart showing of the display flow of a menu screen in which a shuffle range is specified; and

FIG. 8 is a flowchart showing of the processing flow of the selection between the random playback mode on a piece of music basis and the random playback mode on an album basis.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

This invention will be described in further detail by way of example with reference to the accompanying drawings. Now, referring to FIG. 1, there is shown a block diagram illustrating a configuration of an audio playback apparatus as one embodiment of the present invention. An audio playback apparatus 1 has a sound source 10 comprised of a hard disk or a DVD which is large in storage capacity for storing large amounts of data, an output unit 20 for outputting signals supplied from the sound source 10 to the outside, a user interface (UI) 30 through which the user understands the operation status of the audio playback apparatus 1 and operates the audio playback apparatus 1, and a system control block 40 for controlling the audio playback apparatus 1 in its entirety.

The sound source 10 records music files as the sound source in a hierarchical structure. FIG. 2 illustrates an internal structure of the sound source 10

which records music files in a hierarchical structure. As shown in FIG. 2, a plurality of folders are formed in the sound source 10, one or more albums being formed in each folder. An album herein denotes a set of music files in which one or more pieces of music (music files) are collected; generally, one platter of CD is called an album. A folder herein denotes a set of music files in which one or more albums are collected.

To be more specific, in the sound source 10, a plurality of folders are formed as a first layer, one or more albums are formed in each folder as a second layer, and one or more Music files are recorded as sound source file in each album as a third layer.

In the internal configuration of the sound source 10 shown in FIG. 2, n folders, folders 1, 2, ... n, are formed in a hard disk (a main folder) arranged in the sound source 10. In folder 1, albums 1a, 1b, ... 1m are recorded and albums 2a, 2b, ... 2p are recorded in folder 2. This same holds true with folders 3 through n. Further, music files Music-1a1, Music-1a2, ... Music-1ax are recorded in album 1a, music files Music-1b1, Music-1b2, ... Music-1by are recorded in album 1b, and music files Music-2a1, Music 2a2, ... Music-2az are recorded in album 2a. The same holds true with the other albums.

It should be noted that a configuration in which folders are formed in each of the above-mentioned folders may be applied in addition to the above-mentioned configuration shown in FIG. 2.

The output unit 20 converts the signal supplied from the sound source 10 into a form which can be outputted to a speaker, an external amplifier, or a headphone for example. A speaker may be arranged on the output unit 20 to directly output the signal supplied from the sound source 10 to the outside as a sound.

The user interface 30, configured with a display block and an operator block, provides the interface through which the user understands the operation status of the audio playback apparatus 1 on the basis of the information provided on the display block and operates the audio playback apparatus 1 on the basis of the user's intention. For example, the display block shows volume level, bass and treble levels, front rear right left volume balances. On the operator block, the user can perform various input operations such as operating a power switch and changing random playback mode for example. It should be noted that the display block may be comprised of a liquid crystal display monitor and the display screen on the display block may be formed by a

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tablet such as a touch-sensitive pad or a touch-sensitive

screen, thereby providing a configuration in which the

display block and the operator block are integrated to

allow the user to perform the above-mentioned input

operations by simply touching the screen.

Alternatively, for the operator block, a remote

controller based on a jog dial may be used to provide a

configuration in which the display block and the operator

block are separate from each other.

The system control block 40 is based on a

microcomputer. In response to signals supplied from the

user interface 30, the system control block 40 execute

such control operations on the sound source 10 as

selective playback of music, fast-forwarding and review

of music, and random playback of music which is described

below. In addition, the system control block 40 executes

such control operations on the output unit 20 as changing

output levels and tone qualities and transmits display

information to the user interface 30. Thus, the system

control block 40 controls the audio playback apparatus 1

in its entirety.

The following describes the random playback

operation to be executed by the system control block 40.

In the above-mentioned embodiment, random playback may be

executed in unit of one album or one folder in addition
to one piece of music. Namely, for the unit of music
files which are reproduced in one cycle, the user may
choose one of one music file, one album, and one folder.
Hereafter, the random playback on an album basis will be
referred to as shuffle album (SHUF-A) and the random
playback on a folder basis will be referred to as a
shuffle folder (SHUF-F). In response to the specification
entered through the user interface 30, the system control
block 40 may set a SHUF-A mode for executing SHUF-A
playback and a SHUF-F mode for executing SHUF-F playback
in addition to the mode in which the random playback in
unit of one piece of music is executed.

FIG. 3 shows a flowchart of a processing flow at
the time when the system control block 40 executes SHUF-A
playback. FIG. 4 shows a flowchart of a processing flow
at the time when the system control block 40 executes
SHUF-F playback. As shown in FIG. 3, in SHUF-A playback,
the selected piece of music is reproduced (S101) first, a
decision is made whether the playback of this piece of
music has ended (S102), and if this playback is found not
ended, the playback is continued. If the playback is
found ended, a decision is made whether the SHUF-A mode
has been specified by the user (S103). If the SHUF-A mode

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is found not set, normally the piece of music to be reproduced next (if all pieces of music contained in the album have been reproduced, the album to be reproduced next) is taken up (S104), upon which the procedure returns to step S101 to reproduce that piece of music.

If the SHUF-A mode is found set, then a decision is made whether all pieces of music in the album have been reproduced (S105) and, if there is any piece of music not yet reproduced in the album, the piece of music to be reproduced next is taken up (S106), upon which the procedure returns to step S101 to reproduce that piece of music.

If all pieces of music in the album have been reproduced, then an album to be reproduced is randomly selected (S107) and the piece of music to be reproduced first in the album is taken up (S108), upon which the procedure returns to step S101 to reproduce that piece of music.

It should be noted that, in the SHUF-A playback of the present embodiment, the piece of music to be reproduced next is selected in step S106 in the order of the recording in that album; it is also practicable that the inside of that album is shuffled by executing random music selection in that album and, after all pieces of

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music in that album have been reproduced, the next album
is selected (S107).

Next, as shown in FIG. 4, in the SHUF-F playback,
the piece of music currently selected is reproduced first
(S201) and then a decision is made whether the playback
of that piece of music has ended (S202). If the playback
of that piece of music is found not ended, then the
playback is continued. If the playback is found ended, a
decision is made whether the SHUF-F mode is currently set
by the user (S203). If the SHUF-F mode is found not set,
normally the piece of music to be reproduced next is
taken up (S204) (if all pieces of music in the folder
have been reproduced, the next folder is taken up to and
the first piece of music in that folder is taken up),
upon which the procedure returns to step S204 to
reproduce that piece of music.

If the SHUF-F mode is found set, a decision is
made whether all pieces of music in the folder have been
reproduced (S205) and, if there is any piece of music not
yet reproduced, the next piece of music in that folder is
taken up (S206), upon which the procedure returns to step
S201 to reproduce that piece of music. If the folder has
two or more albums, the playback is executed starting

with the first piece of music of each of the albums arranged in a predetermined order.

When all pieces of music in the folder have been reproduced, a folder to be reproduced next is randomly selected (S207) and the first piece of music in the selected folder is taken up (S208), upon which the procedure returns to step S201 to reproduce that piece of music.

It should be noted that, in the SHUF-F playback of the present embodiment, when selecting the next piece of music in the folder in step S206, the selection is made in the order of the pieces of music recorded to that folder and, if the folder has two or more albums, the playback is executed starting with the first piece of music in each of the albums arranged in a predetermined order; it is also practicable that the inside of that folder is shuffled by executing random music selection in that folder and, after all pieces of music in that folder have been reproduced, the next folder is selected (S207).

It is also practicable that, in step S206, albums in the folder are randomly selected and the inside of that folder is shuffled on an album basis, thereby reproducing the selected albums in the order of recording and, by executing random selection inside the selected

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album, shuffling the inside that album for playback. Then,
after all pieces of music in that folder have been
reproduced, the next folder is taken up (S207).

The following describes a procedure of the
selection of the random playback mode by the user. It is
assumed in this procedure that a mode for the random
playback in unit of one piece of music and a mode for the
random playback in unit of one album (SHUF-A) be provided.
The mode for random playback in unit of one piece of
music is referred to as a shuffle one song mode (SHUF-1).

FIGS. 5A and 5B illustrate menu screens which are
displayed on the user interface 30 when the SHUF-1 mode
is selected. First, as shown in FIG. 5A, a menu screen
for specifying the minimum shuffle unit is displayed;
when the SHUF-1 mode is selected, a color change takes
place in the display "One Song". In the figure, this
color change is indicated by hatching (the same holds
true with the following description). Next, when the
minimum shuffle unit has once been specified, a menu
screen for specifying a shuffle range is displayed on the
display screen. FIG. 5B illustrates an example in which
"Album" is selected as the shuffle range. In this case,
an album is randomly selected or an album is specified by

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the user and one piece of music in the selected album is randomly selected for playback, which is repeated.

In FIG. 5B, "All" denotes an area in which all pieces of music recorded to the sound source 10 are subjected to random playback; "Folder" denotes an area in which the inside of a folder randomly selected or specified by user is subjected to random playback; "Album" denotes an area in which the inside of an album randomly selected or specified by the user is subjected to random playback; and "Off" denotes an area in which the random playback mode is turned off. The same holds true with the following description.

FIGS. 6A, 6B, and 6C illustrate menu screens which are displayed on the user interface 30 when the SHUF-A playback is selected. In this case, as shown in FIG. 6A, in the menu screen for specifying the minimum shuffle unit, a color change takes place in display "Album" when the SHUF-A playback is selected, on the display screen of the user interface 30. Next, a menu screen for specifying a shuffle range appears on the display screen, in which, because the SHUF-A playback is selected, it is insignificant to select "Album", so that, in order to display that "Album" cannot be selected, "Album" is displayed in a tone down manner as shown in FIG. 6B or

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"Album" is not displayed at all as shown in FIG. 6C. Therefore, the user comes to select one of "All", "Folder", and "Off" on the menu screen for shuffle range specification. Referring to FIGS. 6B and 6C, "Folder" is selected.

Consequently, in the above-mentioned example, a folder is randomly selected or specified by the user, then an album is randomly selected in that folder, and all pieces of music in the selected album are sequentially or randomly selected for playback. After the playback of all pieces of music in that folder, another album is randomly selected in that folder and all pieces of music in the selected album are reproduced, which is repeated.

The following describes a procedure of displaying the menu screen by the system control block 40 when specifying a shuffle range. It is assumed here that a mode for the random playback in unit of one piece of music and a mode for the random playback in unit of one album be provided in the example to be described below.

FIG. 7 is a flowchart showing the flow of displaying a menu screen at the time when a shuffle range is specified. First, a menu screen for selecting the specification of the minimum shuffle unit is displayed

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(S301). To be more specific, first, the specification of
the minimum shuffle unit is preferentially performed and
one of "Album" and "One Song" is selected. Next, if "One
Song", namely one piece of music, is selected, "All",
"Folder", "Album", and "Off" are displayed as the screen
for shuffle range specification (S302). On the other hand,
if "Album", namely an album, is selected, "All", "Folder",
and "Off" are displayed as the screen for shuffle range
specification (S303).

The following describes the random playback
processing to be executed by the system control block 40
if the capability of selecting between the SHUF-1 and
SHUF-A modes is provided. FIG. 8 is a flowchart showing
the flow of the processing for selecting between the
SHUF-1 and SHUF-A modes by the user.

As shown in FIG. 8, when the random playback mode
is selected, a menu screen for specifying the minimum
shuffle unit is displayed on the user interface 30 and
the minimum shuffle unit is set (S401). Next, a menu
screen for specifying a shuffle range according to the
selected minimum shuffle unit is displayed and the
shuffle range is set (S402).

Next, a decision is made whether the playback of
the currently reproduced piece of music has been

completed (S403); if the playback is found not completed, the playback is continued. If the playback is found completed, a decision is made whether the minimum shuffle unit specified by the user in step S401 is one piece of music or one album (S404). If the SHUF-1 mode is specified, the shuffle range specified in step S402 is determined, a piece of music is randomly selected within the specified range, and the selected piece of music is reproduced (S405).

If the SHUF-A is specified in step S404, then a decision is made whether all pieces of music in the album to which the currently reproduced piece of music belongs have been reproduced (S406). If there are found in step S406 any pieces of music not yet reproduced, these pieces of music are reproduced (S407). On the other hand, if all pieces of music in that album are found reproduced, an album is randomly selected within the shuffle range specified in step S402 and all pieces of music contained in the selected album are reproduced starting with the first piece of music (S408). Then, albums are randomly selected and reproduced until all albums within the specified range are reproduced.

It should be noted that, in the above-mentioned embodiment, a shuffle range is specified after selecting

the minimum shuffle unit specification; it is also practicable that, after selecting the minimum shuffle unit specification, a shuffle range is automatically set all over the areas recorded to the sound source 10.

As described, in the present embodiment, music files to be reproduced in one cycle can be reproduced in unit of albums or folders, thereby eliminating the necessity for executing, when the user wants to listen all albums containing a piece of music listened after a long interval for example, the cumbersome operations of once canceling the random playback mode and, after the reproduction of that album, setting the random playback mode again which are inherent to the related-art technologies. In addition, the above-mentioned embodiment allows the user to select a variety of random playback modes to the user's liking.

As described and according to the invention, random playback can be executed in unit of each album or each folder.

While a preferred embodiments of the present invention have been described using specific terms, such description is for illustrative purposes only, and it is to be understood that changes and variations may be made

without departing from the spirit or scope of the

following claims.